

PATENT ABSTRACTS OF JAPAN

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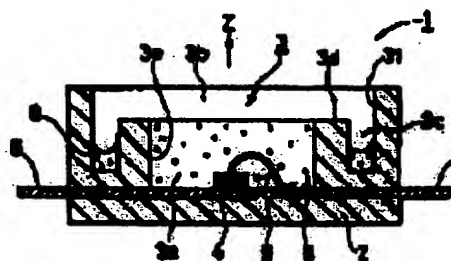
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(54) LIGHT-RECEIVING/LIGHT-EMITTING ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent irregularity in performance of a light-receiving/light-emitting element, reduction in a detection efficiency and the like from being generated by a method wherein a recess part provided in a case is formed of a chip arrangement part for arranging a light-receiving/light-emitting chip and a surface-shaped adjustment part having an aperture diameter larger than that of the chip arrangement part into a step shape and a resin guide groove is provided along the outer periphery of the bottom of the adjustment part.

SOLUTION: A surface-shaped adjustment part 3b is formed as an aperture diameter larger than that of a chip arrangement part 3a and is formed almost concentrically with the part 3a. A recess part 3 is formed into a two-step step shape having step parts 3d generated by the bottom of the part 3b. Thereby, by making molding resin flow in a resin guide groove, the deformation of the surface of the part 3a, which is hitherto generated by the wall surfaces of the part 3a and the surface tension of the molding resin, is eliminated and a plane is obtained on the surface of the part 3a. Moreover, by making the resin flow in the groove, the thickness of the part 3a is also held constant during the time of filling the groove. Accordingly, an irregularity in the performance of a light-receiving/light-emitting element, which is caused by the molding resin, reduction in a detection efficiency and the like can be prevented from being generated.



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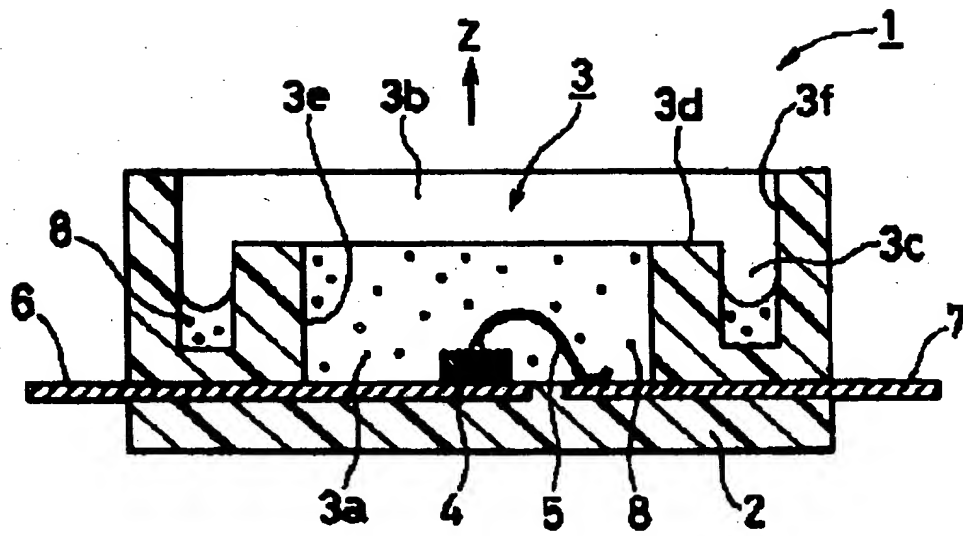
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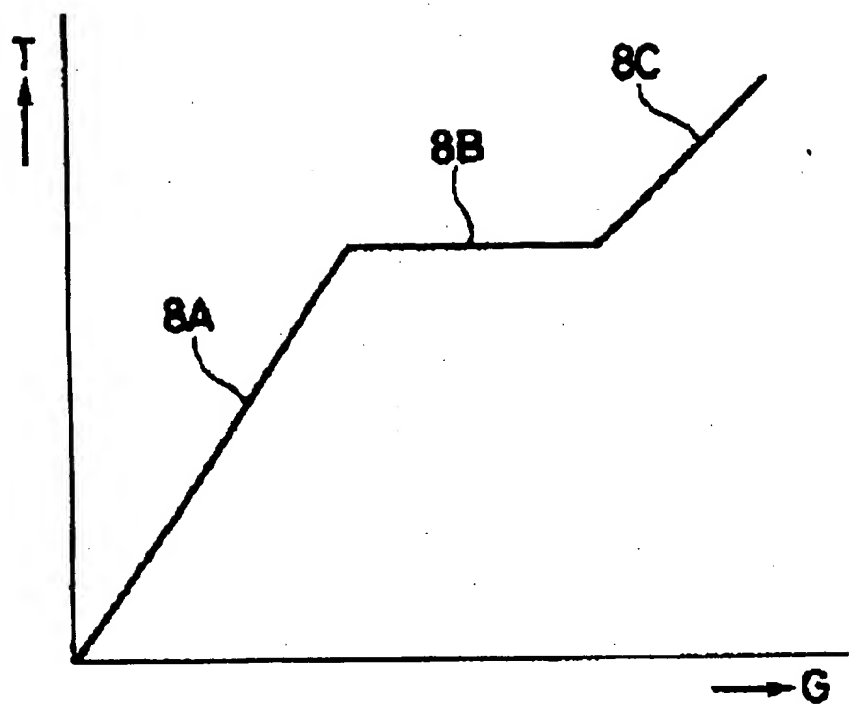
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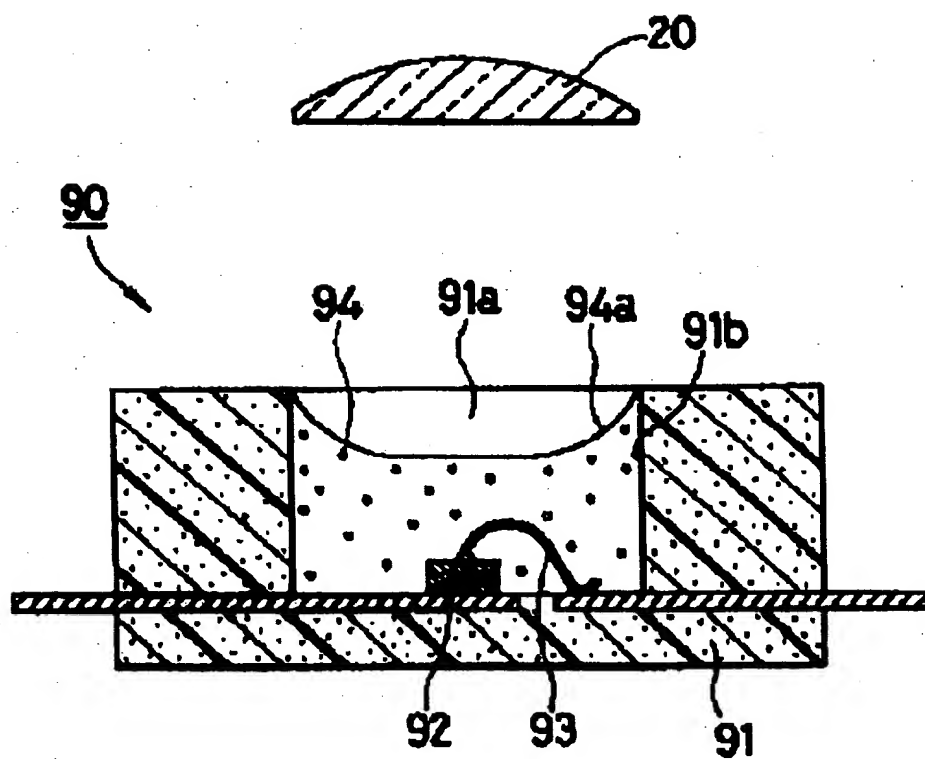
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing 1 operation gestalt of light-receiving/light emitting device concerning this invention.

[Drawing 2] It is the graph which shows the relation of the injection rate of mold resin and thickness in the same operation gestalt.

[Drawing 3] It is the sectional view showing the conventional example.

[Description of Notations]

- 1 Light-receiving (luminescence) component
- 2 Case
- 3 Crevice
- 3a Chip arrangement section
- 3b Field configuration controller
- 3c Resin induction slot
- 3d Level difference section
- 3e Wall surface of the chip arrangement section
- 3f Wall surface of a field configuration controller
- 4 Luminescence chip
- 5 Bonding wire
- 6 Leadframe for mounting
- 7 Leadframe for wiring
- 8 Mold resin

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a detail at the configuration of the above-mentioned light-receiving/light emitting device about the semi-conductor light emitting device called the semi-conductor photo detector called the photodiode component etc. or the LED component.

[0002]

[Description of the Prior Art] After it being drawing 3 which shows the example of the configuration of the conventional photo detector 90, for example, preparing crevice 91a of an owner bottom in the case 91 formed opaquely black with silicon resin, mounting the light-receiving chips 92, such as a photodiode, on the base of this crevice 91a and wiring by the bonding wire 93, said crevice 91a is filled up with transparent mold resin 94.

[0003] It becomes what penetrates mold resin 94 for the light-receiving chip 92, and light attains by considering as the above configurations, and this photo detector 90 is used for usual combining the lens 20 for setting up a light-receiving angle etc. In addition, if it changes to the light-receiving chip 92 and luminescence chips, such as a light emitting diode, are mounted, a light emitting device will completely be obtained with the same configuration.

[0004]

[Problem(s) to be Solved by the Invention] However, in the above mentioned conventional configuration, since it becomes the thing which is depended on the surface tension of a liquid at wall surface 91b of this crevice 91a and which creeps up, produces section 94a and is hardened in the state of that ** in case said crevice 91a is filled up with the liquefied mold resin 94 before hardening, a flat surface is not acquired in the front face of mold resin 94.

[0005] Therefore, when combined with said lens 20 etc. in actual use, by turbulence of the configuration of the front face of the above-mentioned mold resin 94, it became what cannot converge light to the light-receiving chip 92, and troubles, such as variation in engine performance, such as a light-receiving include angle, and decline in detection efficiency, are produced.

[0006] moreover, it is not only influenced by the above-mentioned surface tension, but since it is influenced by the fill of mold resin 94, the variation in said detection sensitivity carried out, the decline in detection efficiency, etc. became the inclination which is further alike and is expanded, and, as for the location of said front face carried out, and a configuration, solution of these points has made them the technical problem.

[0007]

[Means for Solving the Problem] In light-receiving/light emitting device which this invention arranges light-receiving/luminescence chip as a concrete means for solving the above mentioned conventional technical problem on the base of the crevice of the owner bottom established in the case, and fills up this crevice with transparent mold resin, and grows into it Said crevice is formed in the shape of a level difference by the chip arrangement section which arranges said light-receiving/luminescence chip, and the field configuration controller made into the larger diameter of opening than it. If the periphery of the

base of said field configuration controller is met, a technical problem is solved by offering light-receiving/light emitting device characterized by preparing the resin induction slot.

[0008]

[Embodiment of the Invention] Below, this invention is explained to a detail based on the operation gestalt shown in drawing. Although it is light-receiving/light emitting device concerning this invention which are shown in drawing 1 and the example when considering as a photo detector 1 explains with this operation gestalt, as explained also above, also when considering as a light emitting device, it is possible to completely carry out similarly.

[0009] Although the case 2 formed with opaque black silicon resin etc. like the conventional example is adopted as said photo detector 1 also in this invention, the crevice 3 established in said case 2 is constituted from chip arrangement section 3a, field configuration controller 3b, and resin induction slot 3c by this invention.

[0010] the thing which said chip arrangement section 3a arranges the light-receiving chips 4 (they are luminescence chips, such as a light emitting diode, when considering as a light emitting device), such as a photodiode, like the conventional example, and wires by the bonding wire 5 here and which can be folded -- it is -- the thing of the conventional example, and ** ** -- it is formed so that it may have the configuration and area of the same opening.

[0011] On the other hand, said field configuration controller 3b is formed as a bigger diameter of opening than said chip arrangement section 3a, with said chip arrangement section 3a, it is formed as ***** and, thereby, said crevice 3 is made into the shape of two steps of level differences which has 3d of level difference sections produced by the base of said field configuration controller 3b.

[0012] At this time, the configuration of opening of said chip arrangement section 3a and field configuration controller 3b may be made into the configuration from which you may be similarity or a square, a round shape, etc. differ. And if the periphery of the base of 3d of said level difference sections, i.e., field configuration controller 3b, is met, resin induction slot 3c is prepared.

[0013] In addition, since a crevice 3 is formed in the direction shown by the arrow head Z in drawing 1 by drawing out metal mold when forming a case 2, also when it considers as the configuration of this invention, it can carry out, without producing the process of the addition only by only changing the metal mold configuration of the part which does not adopt a rate mold etc. and corresponds etc.

[0014] When forming a photo detector 1 using the case 2 considered as the configuration of the above-mentioned explanation, a photo detector 4 is first mounted on the leadframe 6 for mounting located in the base of chip arrangement section 3a, and wiring with the leadframe 7 for wiring is performed by the bonding wire 5 after that, then restoration of mold resin 8 is performed to chip arrangement section 3a of said crevice 3.

[0015] Drawing 2 shows the relation between the injection rate G of mold resin 8 when pouring said mold resin 8 into the crevice 3, and thickness T in a crevice 3, and first, as curvilinear 8A shows all over drawing, in proportion to an injection rate G, thickness T increases it, until an injection rate G reaches 3d of level difference sections and in other words it fills chip arrangement section 3a.

[0016] And as curvilinear 8B shows all over drawing until said resin induction slot 3c is filled with mold resin 8, since said mold resin 8 will become what flows in 3d of level difference sections, and flows into resin induction slot 3c, if 3d of level difference sections is reached, even if an injection rate G increases, thickness T maintains constant value.

[0017] Furthermore, if an injection rate G is increased, after said resin induction slot 3c is filled, it will become that with which field configuration controller 3b is filled up, and as curvilinear 8C shows all over drawing, thickness T will increase again. However, since field configuration controller 3b is greatly formed in opening area rather than chip arrangement section 3a, the rate of the increment in thickness T to an injection rate G decreases.

[0018] Although a front face does not turn into a flat surface with wall surface 3e of chip arrangement section 3a, and the surface tension of mold resin 8 and a flat surface is not similarly acquired in the section of curvilinear 8C in the section of curvilinear 8A with 3f of wall surfaces and surface tension of field configuration controller 3b at this time, it differs in a situation in the section of curvilinear 8B.

[0019] Namely, since it becomes what goes caudad and flows so that this resin induction slot 3c may be filled when the mold resin 8 with which chip arrangement section 3a was overflowed flows in 3d of level difference sections in the section of curvilinear 8B as described above, and resin induction slot 3c is reached The front face of the mold resin 8 with which the phenomenon in which mold resin 8 crept up with the above mentioned wall surfaces 3e and 3f and surface tension was not produced, and restoration was performed turns into a flat surface.

[0020] In addition, the amount which turns into an injection rate G with what produces tolerance, for example, adheres and carries out the remainder to a restoration equipment side since thickness T is kept constant until said resin induction slot 3c is filled is unfixed, and pouring in a strict constant rate makes it easy like the packer of very difficult mold resin 8.

[0021] Therefore, it becomes what is obtained without the prearranged engine performance producing the variation by each photo detector 1 when according to this invention restoration of the mold resin 8 which a front face is a flat surface and makes thickness uniform is attained, for example, it combines with a lens etc., and a production process becomes easy rather by the tolerance to the injection rate G produced by resin induction slot 3c at this time.

[0022]

[Effect of the Invention] The chip arrangement section which arranges light-receiving/luminescence chip for the crevice established in a case by this invention as explained above, It is having considered as light-receiving/light emitting device in which the resin induction slot's is established if it forms in the shape of a level difference by the field configuration controller made into the larger diameter of opening than it and the periphery of the base of said field configuration controller is met. By making mold resin flow into said resin induction slot, conventionally, shall abolish deformation of the front face produced in the wall surface of the chip arrangement section and the surface tension of mold resin, and a flat surface shall be acquired. furthermore, as that to which thickness is also kept constant until this resin induction slot is filled with making mold resin flow into said resin induction slot The effectiveness which was extremely excellent in the improvement in the engine performance as what does not produce the variation in the engine performance resulting from mold resin, decline in detection efficiency, etc. in light-receiving/light emitting device is done so.

[0023] Moreover, the amount which adheres and carries out the remainder to for example, a restoration equipment side by the tolerance where said resin induction slot is prepared and thickness is kept constant to the injection rate of mold resin having been generated is unfixed, it becomes what gives tolerance like the packer of very difficult mold resin to pour in a strict constant rate, and the effectiveness which enabled simplification of a production process and is extremely excellent also in improvement in productivity does so collectively.

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CLAIMS

[Claim(s)]

[Claim 1] In light-receiving/light emitting device which arranges light-receiving/luminescence chip on the base of the crevice of the owner bottom established in the case, fills up this crevice with transparent mold resin, and grows into it Light-receiving/light emitting device characterized by preparing the resin induction slot if said crevice is formed in the shape of a level difference by the chip arrangement section which arranges said light-receiving/luminescence chip, and the field configuration controller made into the larger diameter of opening than it and the periphery of the base of said field configuration controller is met.

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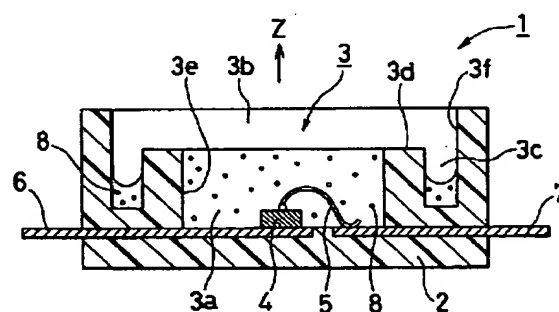
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(54) 【発明の名称】 受光／発光素子

(57) 【要約】

【課題】 従来のこの種の受光／発光素子においてはケースの凹部に充填するモールド樹脂の表面形状および厚みが一定せず、これにより性能のバラツキ、効率の低下などを生じて品質が安定しない問題点を生じている。

【解決手段】 本発明により、ケース2に設けられる凹部3をチップ配置部3aと、それよりも大きい開口径とした面形状調整部3bとで段差状に形成し、面形状調整部3bの底面の外周に沿って樹脂誘導溝3cが設けられている受光／発光素子1としたことで、樹脂誘導溝3cにモールド樹脂8を流れ込ませることで、表面の変形をなくし平面が得られるものとすると共に、樹脂誘導溝3cにモールド樹脂8を流れ込ませることで、樹脂誘導溝3cが満たされる迄の間は厚みも一定に保たれるものとし、モールド樹脂8に起因する性能のバラツキ、検出効率の低下などを生じないものとして課題を解決する。



【特許請求の範囲】

【請求項1】 ケースに設けられた有底の凹部の底面に受光／発光チップを配置し、該凹部に透明なモールド樹脂を充填して成る受光／発光素子において、前記凹部を前記受光／発光チップを配置するチップ配置部と、それよりも大きい開口径とした面形状調整部とで段差状に形成し、前記面形状調整部の底面の外周に沿っては樹脂誘導溝が設けられていることを特徴とする受光／発光素子。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、フォトダイオード素子などと称されている半導体受光素子、或いは、LED素子などと称されている半導体発光素子に関するものであり、詳細には上記受光／発光素子の構成に係るものである。

【0002】

【従来の技術】 従来の受光素子90の構成の例を示すものが図3であり、例えばシリコン樹脂で黒色不透明に形成されたケース91には有底の凹部91aが設けられ、この凹部91aの底面にフォトダイオードなど受光チップ92をマウントし、ボンディングワイヤ93で配線を行った後に、前記凹部91aに透明なモールド樹脂94を充填する。

【0003】 以上のような構成とすることで、受光チップ92にはモールド樹脂94を透過して光が達するものとなり、この受光素子90は通常には受光角を設定するためのレンズ20などと組み合わせて使用されるものとなる。尚、受光チップ92に換えて発光ダイオードなど発光チップをマウントすれば、全く同一の構成で発光素子が得られるものとなる。

【0004】

【発明が解決しようとする課題】 しかしながら、前記した従来の構成においては、前記凹部91aに硬化前の液状のモールド樹脂94を充填する際に、この凹部91aの壁面91bに液体の表面張力による這上がり部94aを生じて、その儘の状態では硬化するものとなるので、モールド樹脂94の表面には平面が得られることはないものとなる。

【0005】 従って、実際の使用にあたり、前記レンズ20などと組み合わされた場合、上記したモールド樹脂94の表面の形状の乱れにより、例えば受光チップ92への光の収束が行えないものとなり、受光角度など性能のバラツキ、検出効率の低下などの問題点を生じるものとなっている。

【0006】 また、前記した表面の位置、形状は上記した表面張力により左右されるばかりでなく、モールド樹脂94の充填量によっても左右されるので、前記した検出感度のバラツキ、検出効率の低下などは一層に拡大される傾向となり、これらの点の解決が課題とされるもの

となっている。

【0007】

【課題を解決するための手段】 本発明は前記した従来の課題を解決するための具体的な手段として、ケースに設けられた有底の凹部の底面に受光／発光チップを配置し、該凹部に透明なモールド樹脂を充填して成る受光／発光素子において、前記凹部を前記受光／発光チップを配置するチップ配置部と、それよりも大きい開口径とした面形状調整部とで段差状に形成し、前記面形状調整部の底面の外周に沿っては樹脂誘導溝が設けられていることを特徴とする受光／発光素子を提供することで課題を解決するものである。

【0008】

【発明の実施の形態】 つぎに、本発明を図に示す実施形態に基づいて詳細に説明する。図1に示すものは本発明に係る受光／発光素子であり、この実施形態では受光素子1としたときの例で説明するが、上記にも説明したように発光素子とする場合も全く同様に実施することが可能である。

【0009】 本発明においても前記受光素子1には従来例と同様に黒色不透明なシリコン樹脂などにより形成されたケース2が採用されるが、前記ケース2に設けられる凹部3は本発明によりチップ配置部3aと面形状調整部3bと樹脂誘導溝3cとで構成されている。

【0010】 ここで、前記チップ配置部3aは従来例と同様にフォトダイオードなどの受光チップ4（発光素子とする場合は発光ダイオードなどの発光チップ）を配置しボンディングワイヤ5で配線を行うためのものであり、従来例のものとほぼ同一の開口部の形状および面積を有するように形成されるものである。

【0011】 これに対して、前記面形状調整部3bは前記チップ配置部3aよりも大きな開口径として形成されるものであり、前記チップ配置部3aとは略同芯として形成され、これにより、前記凹部3は前記面形状調整部3bの底面により生じた段差部3dを有する二段の段差状とされている。

【0012】 このときに、前記チップ配置部3aと面形状調整部3bとの開口部の形状は相似であっても良く、或いは、正方形と円形など異なる形状とされていても良い。そして、前記段差部3d、即ち、面形状調整部3bの底面の外周に沿っては樹脂誘導溝3cが設けられている。

【0013】 尚、ケース2を形成するときには、凹部3は図1中に矢印Zで示す方向に金型を引き抜くことで形成されるものであるので、本発明の形状としたときにも、割り型などを採用することはなく、相当する部分の金型形状を変更するのみで追加の工程など生じることなく実施が可能である。

【0014】 上記説明の構成としたケース2を用いて受光素子1を形成するときには、先ず、チップ配置部3a

の底面に位置するマウント用リードフレーム6に受光素子4をマウントし、その後にボンディングワイヤ5で配線用リードフレーム7との配線を行い、続いて、モールド樹脂8の充填が前記凹部3のチップ配置部3aに対して行われるものとなる。

【0015】図2は、前記モールド樹脂8を凹部3に注入していくときの、モールド樹脂8の注入量Gと、凹部3内での厚みTとの関係を示すもので、まず、注入量Gが段差部3dに達するまで、言い換えればチップ配置部3aを満たすまでは、図中に曲線8Aで示すように、注入量Gに比例して厚みTが増加するものとなる。

【0016】そして、段差部3dに達すると、前記モールド樹脂8は段差部3dを流れて樹脂誘導溝3cに流れ込むものとなるので、前記樹脂誘導溝3cがモールド樹脂8で満たされる迄の間は、図中に曲線8Bで示すように、注入量Gが増えても厚みTは一定値を保つものとなる。

【0017】更に注入量Gを増すと、前記樹脂誘導溝3cが満たされた後には面形状調整部3bが充填されるものとなり、図中に曲線8Cで示すように厚みTは再び増加するものとなる。但し、チップ配置部3aよりも面形状調整部3bが開口面積を大きく形成されているので、注入量Gに対する厚みTの増加の割合は減少するものとなる。

【0018】このときに、曲線8Aの区間ではチップ配置部3aの壁面3eとモールド樹脂8の表面張力とで表面が平面とならないものであり、曲線8Cの区間でも面形状調整部3bの壁面3fと表面張力とで同様に平面が得られないものであるが、曲線8Bの区間では状況を異にする。

【0019】即ち、曲線8Bの区間では、前記したようにチップ配置部3aを溢れたモールド樹脂8は段差部3dを流れ、樹脂誘導溝3cに到達した時点でこの樹脂誘導溝3cを満たすように下方に向かい流れるものとなるので、前記した壁面3e、3fと表面張力とによりモールド樹脂8が食い上がる現象は生じることがなく、充填が行われたモールド樹脂8の表面は平面となる。

【0020】加えて、前記樹脂誘導溝3cが満たされる迄の間は厚みTが一定に保たれるものであるもので、注入量Gには許容範囲を生じるものとなり、例えば、充填装置側に付着して残余する量が不定であり、厳密な一定量を注入することが極めて困難なモールド樹脂8の充填工程を容易とするものとなる。

【0021】従って、本発明によれば表面が平面で且つ厚みを均一とするモールド樹脂8の充填が可能となり、例えばレンズなどと組み合わせたときには予定通りの性能が個々の受光素子1によるバラツキを生じることなく

得られるものとなり、このときに樹脂誘導溝3cにより生じる注入量Gに対する許容範囲により生産工程は寧ろ容易となる。

【0022】

【発明の効果】以上に説明したように本発明により、ケースに設けられる凹部を受光／発光チップを配置するチップ配置部と、それよりも大きい開口径とした面形状調整部とで段差状に形成し、前記面形状調整部の底面の外周に沿っては樹脂誘導溝が設けられている受光／発光素子としたことで、前記樹脂誘導溝にモールド樹脂を流れ込ませることで、従来はチップ配置部の壁面とモールド樹脂の表面張力とで生じていた表面の変形をなくし平面が得られるものとし、更に前記樹脂誘導溝にモールド樹脂を流れ込ませることで、この樹脂誘導溝が満たされる迄の間は厚みも一定に保たれるものとして、受光／発光素子にモールド樹脂に起因する性能のバラツキ、検出効率の低下などを生じないものとして性能向上に極めて優れた効果を奏するものである。

【0023】また、前記樹脂誘導溝が設けられモールド樹脂の注入量に対し、厚みが一定に保たれる許容範囲が生じたことで、例えば充填装置側に付着し残余する量が不定であり、厳密な一定量を注入することが極めて困難なモールド樹脂の充填工程に許容差を与えるものとなり、生産工程の簡易化を可能として生産性の向上にも極めて優れた効果を併せて奏するものである。

【図面の簡単な説明】

【図1】 本発明に係る受光／発光素子の一実施形態を示す断面図である。

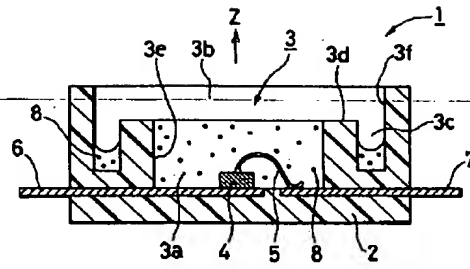
【図2】 同じ実施形態におけるモールド樹脂の注入量と厚みとの関係を示すグラフである。

【図3】 従来例を示す断面図である。

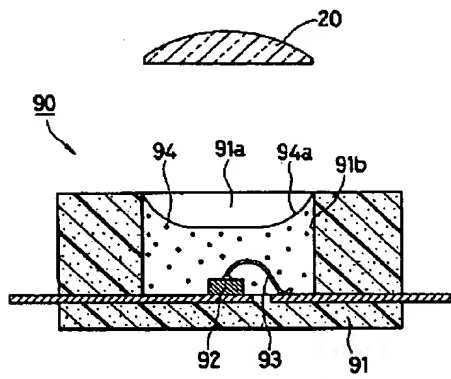
【符号の説明】

- 1……受光（発光）素子
- 2……ケース
- 3……凹部
- 3a……チップ配置部
- 3b……面形状調整部
- 3c……樹脂誘導溝
- 3d……段差部
- 3e……チップ配置部の壁面
- 3f……面形状調整部の壁面
- 4……発光チップ
- 5……ボンディングワイヤ
- 6……マウント用リードフレーム
- 7……配線用リードフレーム
- 8……モールド樹脂

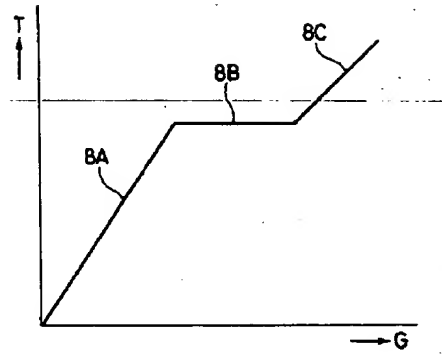
【図1】



【図3】



【図2】



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